Allen-Bradley

Very High Speed Counter Module

Cat. No. 1734-VHSC5 and -VHSC24

User Manual

Rockwell Automation

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

Allen-Bradley is a trademark of Rockwell Automation

Purpose of This Manual

This manual describes how to install, configure and troubleshoot your Very High Speed Counter module.

For Information about:	See:
About the Very High Speed Counter Modules	Chapter 1
Installing the Very High Speed Counter Module	Chapter 2
Very High Speed Counter Module Input and Output Data	Chapter 3
Configuring Your Very High Speed Counter Module	Chapter 4
Accessing Instantiated Instances	Chapter 5
Troubleshooting with the Indicators	Chapter 6
Specifications	Appendix A

Who Should Use This Manual

You must be able to use RSNetworx software or similar configuration software to set up and calibrate these modules. You must have the capability to download and use Electronic Data Sheet files.

We assume you know how to do this in this manual. If you do not, refer to your software user manuals or online help before attempting to use these modules.

Related Products and Documentation

The following table lists related 1734 products and documentation.

Description	Cat. No.	Publication
POINT I/O Technical Data	1734-Series	1734-2.1
Sink Input Module Installation Instructions	1734-IB2, -IB4	1734-IN051
Source Output Module Installation Instructions	1734-IV2, -IV4	1734-IN052
Analog Input Module Installation Instructions	1734-IE2C	1734-IN053
Analog Output Module Installation Instructions	1734-OE2C	1734-IN054
Relay Output Module Installation Instructions	1734-OW2	1734-IN055
Protected Output Module Installation Instructions	1734-OB2E, -OB4E	1734-IN056

Description	Cat. No.	Publication
DeviceNet Communication Interface Installation Instructions	1734-PDN	1734-IN057A
POINT I/O 24V dc Expansion Power Supply Installation Instructions	1734-EP24DC	1734-IN058A
Field Potential Distributor Installation Instructions	1734-FPD	1734-IN059A
General Installation Instructions	All 1734	1734-5.10
Wiring Base Assembly Installation Instructions	1734-TB, -TBS	1734-5.11
Wiring Base Assembly Installation Instructions	1734-TB3, -TB3S	1734-IN013A

European Communities (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC — Generic Emission Standard, Part 2 — Industrial Environment
- EN 50082-2 EMC — Generic Immunity Standard, Part 2 — Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests. For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as Allen-Bradley publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines.

Open style devices must be provided with environmental and safety protection by proper mounting in enclosures designed for specific application conditions. See NEMA Standards publication 250 and IEC publication 529, as applicable, for explanations of the degrees of protection provided by different types of enclosures.

Definitions

The following define the intended operation of the Very High Speed counter module.

Lead Breakage

Typically requires a shunt resistor (across the load) to detect 3 levels of current/input states -

- Open (Wire Off, Device = ?),
- Off (Wire OK, Device Off),
- On (Wire OK, Device On).

This method does not check the input against a time base, only that the device wiring (current loop) is intact.

Missing Pulse

Typically uses an input pulse to reset a watchdog timer (fixed or programmable HW). This method does detect "Lead Breakage", since a broken wire will time-out the watchdog.

Zero Frequency

Typically uses an input pulse to calculate an input frequency and verify it is above an error threshold. This method does detect "Lead Breakage," since a broken wire will generate a 0Hz. frequency.

"Missing Pulse" or "Zero Frequency" will also detect a customer device stuck "high' or "low", since the counter is monitoring for a change in the input state. Currently, the Counter / Encoder Modes **do not** have Zero Frequency Detection - the "A" & "B" inputs are time independent, only looking for input edge changes to increment/ decrement the count value.

The Period / Rate and Continuous Rate modes **do** have Zero Frequency Detection, since the "Z" input is monitored for Zero Frequency in Firmware (A and B inputs not used, and not monitored).

The Rate Measurement mode inherently has Zero Frequency Detection, since no "A" pulses in any sample period are = 0Hz (B and Z inputs not used, and not monitored).

Operational Mode	Zero Frequency Detection	Input Monitored
Counter	No	None
Encoder	No	None
Period/Rate	Yes	Z Only
Continuous/Rate	Yes	Z Only
Rate Measurement	Y	A Only
PWM	No	None

Table of Contents

Preface

Important User Information 2
Purpose of This Manual P-1
Who Should Use This Manual P-1
Related Products and Documentation. P-1
European Communities (EC) Directive Compliance P-2
EMC Directive P-2
Low Voltage Directive P-2
Definitions P-3

About the Very High Speed Counter Modules

General 1-1
Introducing the Very High Speed Counter Modules 1-1
Module Overview 1-1
Functional Overview 1-1
Operating Modes 1-2
Counter Mode 1-2
Encoder Modes 1-3
Period/Rate Mode 1-5
Operation of Scalar 1-6
Continuous/Rate Mode 1-7
Rate Measurement Mode 1-8
Pulse Width Modulation (. 1-8
New Data Indicator. 1-9
Default Configuration. 1-9
Operating Mode Features 1-10
Operating Mode Features 1-10
Output Control 1-12
Chapter Summary 1-13

Installing the Very High Speed Counter Module

General 2-1
Installing the Mounting Base/ Wiring Base Assembly 2-1
Installing an I/O Module. 2-2
Installing the Removable Terminal Block 2-4
Removing a Mounting Base 2-4
Wiring the 24V dc Very High Speed Counter Module 2-5
Chapter Summary 2-6

Very High Speed Counter Module Input and Output Data

In This Chapter 3-1
Data Table. 3-1
Detailed Description of Data Table Information 3-2
Present Channel Data (Input Word 1) 3-2
Stored/Accumulated Channel Data (Input Word 2) 3-2
Module/Channel Status and Programming Error Codes (Input Words 3 and 4) 3-3
Output Data. 3-5
Counter Control (Word 1) 3-5
Output Control (Word 2) 3-5
Pulse Width Modulation (PWM) Value (Output Word 3) . . . 3-6

Configuration Data 3-6
Counter Configuration (Configuration Word 1) 3-6
Filter Selection (Configuration Word 2) 3-7
Decimal Position (Configuration Word 3) 3-7
Active Output Assembly (Configuration Word 4) 3-8
Time Base/Pulse Width Modulation (PWM) Period (Configuration Word 5) 3-8
Gate Interval (Configuration Word 6) 3-8
Scalar (Configuration Word 7) 3-9
Scalar Selection 3-9
Output 0-1 Ties (Configuration Words 8 and 9) 3-9
Rollover (Configuration Word 10) 3-10
Preset (Configuration Word 11) 3-10
Counter ON and OFF Windows (Configuration Words 12 to 19) 3-10
Safe State Values (Configuration Words 20 through 22) . . . 3-11
Communicating Real Time/Non-real Time Information 3-11

Configuring Your Very High Speed Counter Module

Configuration Overview 4-1
Adding the Adapter to Your Network 4-1
Adding I/O Modules to Your Network 4-2
Setting the Counter's Parameters 4-4
Checking I/O Status and Viewing/Editing the EDS File 4-6

Accessing Instantiated Instances

In This Chapter 5-1
Using Instantiated Instances 5-1
Assemblies 5-3

Troubleshooting with the Indicators

Using the Indicators for Troubleshooting 6-1

Specifications

Specifications for the Very High Speed Counter Module, cat. no. 1734-VHSC24 . . . . . A-1
Input Derating Curve for 1734-VHSC24 . . . . . A-3
Specifications for the Very High Speed Counter Module, cat. no. 1734-VHSC5 . . . . . A-3

About the Very High Speed Counter Modules

General

In this chapter, you will learn about the types of very high speed counters, their features and capabilities.

Introducing the Very High Speed Counter Modules

Module Overview

The counter modules install into the Point I/O terminal base (1734-TB or -TBS) and interface with the Point I/O DeviceNet Pass-through (1734-PDN) or the Point I/O DeviceNet Adapter (1734-ADN). The Counter Module serves as a "signal conditioner" and "function block" (i.e. a counter) between the customer process signals on the terminal base and the PointBus containing the command information. The three main functional blocks are the customer digital I/O interface, the counter "ASIC" and the microprocessor.

Functional Overview

The Counter Module accepts feedback from:

– encoders (either single ended or differential)
– pulse generators
– mechanical limit switches
– frequencies up to 1MHz

A filter is available with four settings:

- 50Hz
- 500Hz
- 5kHz
- 50kHz

The filter can be turned off to achieve the fastest counting rate.

The input voltage range is 5Vdc (VHSC5) or 15-24Vdc (VHSC24). The module returns the count or frequency in the form of a 24 bit binary number (0 - 16,777,215) expressed in a 32 bit long word. Each counter has a user selectable preset and rollover value associated with it.

The 1734-VHSC has 2 outputs that access customer power from the PointBus to facilitate various output device's voltage requirements. The outputs are rated to source 0.5A at 10 to 28.8V dc. The output may be tied to an input. This lets you cascade counters of multiple 1734-VHSC modules. The counter has 4 user-selectable On-Off values (i.e. windows) associated with it. Either output may be tied to any or all of the window signals.

Operating Modes

The very high speed counter modules operate in the following modes:

- Counter Mode - read incoming single phase pulses, return a binary count.
- Encoder Mode - read incoming 2 phase quadrature pulses, return a binary count.
- Period/Rate Mode - count internal clocks during the On period, return a frequency. Outputs updated **only at the end** of the period.
- Continuous/Rate Mode - count internal clocks during the On period, return a frequency. Outputs are updated **continuously** during the period.
- Rate Measurement Mode - read pulses during the sample period, return a frequency.
- PWM Mode (pulse width modulation) - generate a pulse width modulated signal.

The operation of the counter and encoder modes is nearly identical. The difference between the two modes is in the type of feedback (1 phase vs. 2 phase) for the count direction (up or down). In **encoder mode**, a transition is expected on B for counting to proceed in a direction, whereas, in **counter mode**, the B input may be left at a static level.

All operating modes are selected by writing appropriate configuration data to the module.

Counter Mode

The counter mode reads incoming pulses and returns a binary number (0 - $16{,}777{,}215_{max}$) to the PointBus. The counter mode only accepts **single phase** inputs. The module determines the Phase B input state, and counts up or down accordingly.

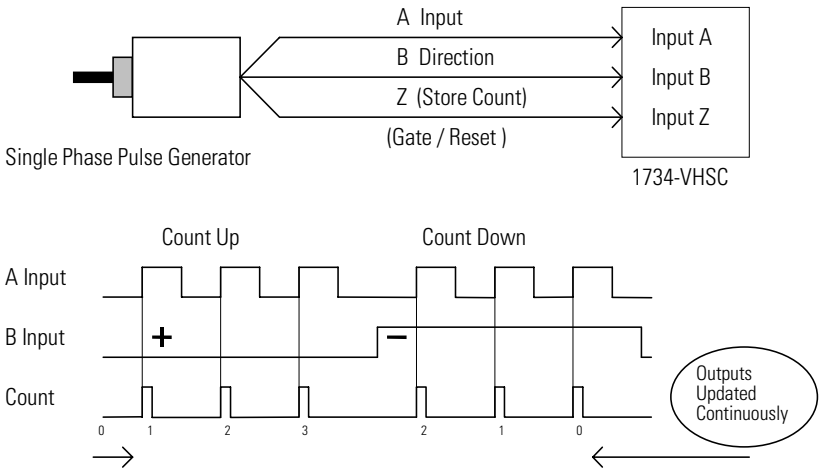
Channel A input is used as the counting pulse while channel B is used to determine the direction.

[B = High, Count = Down; B = Low or floating (not connected), Count = Up]

The Channel B input may be tied high or low for unidirectional counting, or toggled for bidirectional counting.

EXAMPLE

Example of Counter Mode



Encoder Modes

The encoder mode reads incoming pulses and returns a binary number (0 - $16{,}777{,}215_{max}$) to the PointBus. The encoder mode only accepts **2 phase** quadrature inputs. The module senses the relationship between the 2 phases, and counts up or down accordingly.

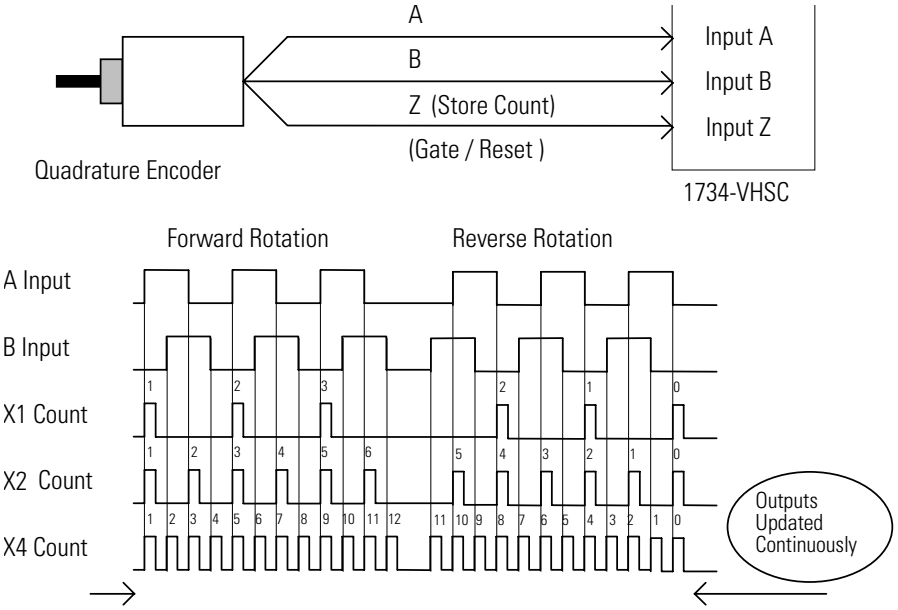
There are two basic encoder types, absolute and incremental. A single output incremental encoder is called a tachometer encoder. A dual channel incremental encoder with one channel leading the other by 90° is called a quadrature encoder.

A system using a quadrature encoder may include an optional zero pulse, or index, serving as a reference mark for system reset. The principal disadvantage of a system using incremental encoders is that a power interruption causes the loss of position reference, so a system must be reinitialized or returned to a known zero position.

Absolute encoders typically have higher speed requirements (200 KHz typical) for motion control applications. An absolute encoder has a unique code associated with each position, so the exact position is always known, even if the system power is turned off.

EXAMPLE

Example of Multiplying Encoder Mode X1, X2 and X4



X1 Multiplying Encoder Mode

Quadrature input signals are used to count on the leading (up direction) OR trailing (down direction) edge of A for a bidirectional count, and channel B is used to determine the direction.

[B = leads A, Count = Down; B = follows A, Count = Up]

X2 Multiplying Encoder Mode

Quadrature input signals are used to count on leading AND trailing edges of A for a bidirectional count, and channel B is used to determine the direction.

[B = leads A, Count = Down; B = follows A, Count = Up]

X4 Multiplying Encoder Mode

Quadrature input signals are used to count on leading AND trailing edges of A AND B for a bidirectional count, and channel B is used to determine the direction.

[B = leads A, Count = Down; B = follows A, Count = Up]

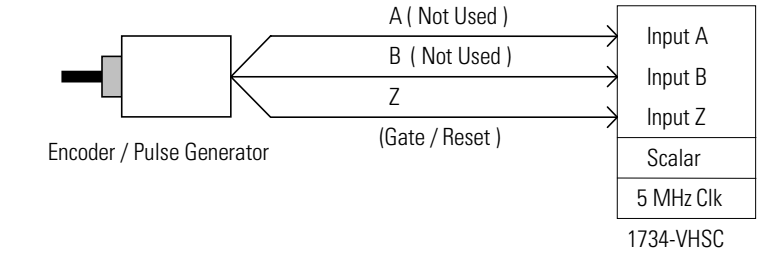
Period/Rate Mode

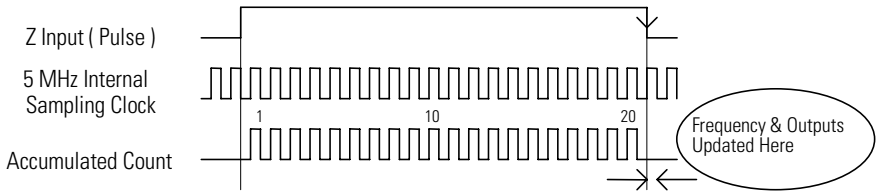
The Period/Rate Mode will return an incoming frequency and a total accumulated count to the PointBus, by gating an internal 5MHz internal clock with an external signal.

This mode determines the frequency and total number of input pulses by counting the number of internal 5MHz clock pulses over a user-specified number of input signal pulses. At the end of the specified number of pulses, the module returns the frequency (0 - 1MHz). When the frequency is updated, both outputs are checked against their associated presets.

EXAMPLE

Example of Period/Rate Mode





Assumes symmetrical pulse, 50% duty cycle, so Period = Sample Time On X 2 {On & Off}
Frequency = 1 / Period If Count = 20, Scalar = 1, and Clock Period = (1 / 5 MHz)
Frequency = 1 / [(20 / 1) X (1 / 5 MHz) X 2] = 125 kHz

As the frequency of the incoming pulse train at the Z (Gate/Reset) terminal increases, the number of sampled pulses from the 5MHz clock decreases. Since accuracy is related to the number of pulses received over the sample period, the accuracy will decrease with increasing frequencies at the Gate/Reset terminal. Refer to the following Scaling table.

Relationship Between Sampled Pulses and Input Frequency

Input Frequency at Z Gate/ Reset Terminal	Sample Pulses for 1/2 Cycle of Z Gate/Reset Pulse
2.5Hz	1M
5Hz	500k
10Hz	250k
20Hz	125k
50Hz	50k
100Hz	25k
200Hz	12.5k
500Hz	5k
1kHz	2.5k
2 Hz	1.25k
5kHz	500
10kHz	250
20kHz	125
50kHz	50
100kHz	25

Scaling the input frequency through the use of a scalar can lessen the decrease in accuracy. A scalar value of 1 will only return an accurate input frequency if incoming input pulses have a 50% duty cycle.

Operation of Scalar

In the Period/Rate and Continuous/Rate modes, the scalar lets the incoming pulse train at the Z Gate/Reset pin be divided by a user defined number. There is one scalar value for each counter. Acceptable values for the scalar are 1, 2, 4, 8, 16, 32, 64, and 128. The default value for each scalar is 1. Note that a “0” scalar is equivalent to a “1”.

The product of the Sample Period times the scalar should be less than 6.71 seconds in order to avoid a zero frequency detect indication.

(5 MHz sample time = 200ns; 16,777,216 counts x 200ns x 2 half cycles of Z = 6.71 seconds)

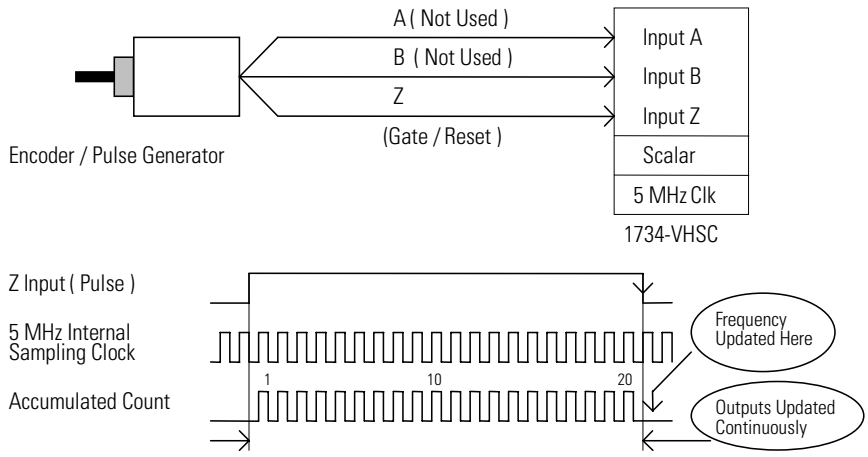
Continuous/Rate Mode

The Continuous/Rate Mode will return an incoming frequency and a total accumulated count to PointBus, by gating an internal 5MHz internal clock with an external signal.

Similar to the Period/Rate mode except outputs in this mode are updated continuously. This mode determines the frequency and total number of input pulses by counting the number of internal 5MHz clock pulses over a user-specified number of input signal pulses. Each output is turned on as soon as the turn-on count is reached, and turned off as soon as the turn-off count is reached. As the internal 5MHz clock is counted, the outputs dynamically track the 5MHz count.

EXAMPLE

Example of Continuous/Rate Mode



Assumes symmetrical pulse, 50% duty cycle, so Period = Sample Time On X 2 {On & Off}
Frequency = 1 / Period If Count = 20, Scalar = 1, and Clock Period = (1 / 5 MHz)
Frequency = 1 / [(20 / 1) X (1 / 5 MHz) X 2] = 125 kHz

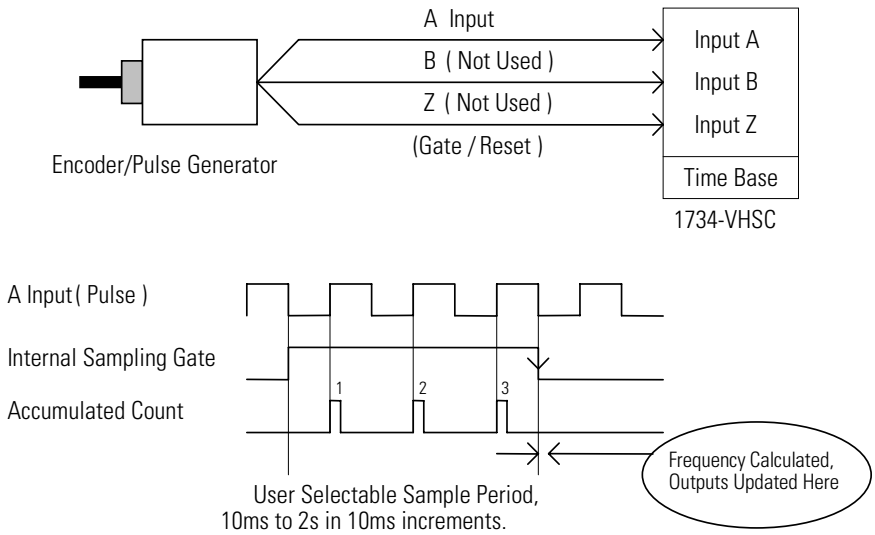
As the frequency of the incoming pulse train at the Z Gate/Reset terminal increases, the number of sampled pulses from the 5MHz clock decreases. Since accuracy is related to the number of pulses received over the sample period, the accuracy will decrease with increasing frequencies at the Gate/Reset terminal. (Refer to the "Operation of Scalar" information and table in the Period/Rate Mode.)

Rate Measurement Mode

The Rate Measurement mode determines the frequency and total number of input pulses over a user-specified sample period. At the end of the interval, the module returns a value representing the sampled number of pulses and a value indicating the incoming frequency. When the count and frequency are updated, any associated outputs are checked against their associated presets. Frequency is calculated by dividing the accumulated count by the user selected time period, and is returned in the read data. Allowable time periods are 10ms to 3s in 10ms increments, with a default value of 1s. Note that a "0" time period is equivalent to the 1s default.

EXAMPLE

Example of Rate Measurement Mode



If Sample Period is 50ms, and Count = 3, then Frequency = 3 /50ms = 60Hz

Pulse Width Modulation (PWM) Mode

The Pulse Width Modulation mode uses the counter to generate a continuous rolling sequence of numbers. The real-time PWM value written to the module is converted to a window edge so that a variable duty cycle signal can be generated. The counter will reset to zero based upon the PWM Period programmed into the module. Any output tied to Window 0 will transmit the PWM signal.

New Data Indicator

A two bit counter, C1 & C0, is updated every time an "event" occurs, indicating that new data is available in the Stored/Accumulated Count words. Events are defined as:

Any active gate transition in any of the **Store Count** (Counter or Encoder) modes;

The end of the gate sample period in either the **Period / Rate**, **Continuous / Rate** or **PWM** modes;

The end of the programmed sample period in the **Rate Measurement** mode.

To use these bits reliably, acquisition of data from the Counter Module must occur faster than the events, which cause C1/C0 to increment. When C1/C0 is updated, a Change Of State (COS) message can be sent.

Default Configuration

The module's default configuration on startup will be:

- Counter Mode
- 50Hz filter on A, B and Z
- No time base
- Active Output Assembly = 105
- Rollover = 0x00FFFFFF
- Preset = 0
- No scalar
- Output 0 untied
- Output 1 untied
- Window comparators = 0
- Counter Control Safe State = 0
- Output Control Safe State = 0

To modify the default settings to those required for your application, refer to chapter 3.

Operating Mode Features

The following table summarizes which features are active in each mode:

Operating Feature	Counter Up / Down	Encoder X1, X2 & X4	Period /Rate	Continuous /Rate	Rate Measurement	PWM
Preset	Y	Y	N	N	N	N
Rollover	Y	Y	N	N	N	N
Software Reset	Y	Y	Y	Y	Y	Y
Store Count - Z Gate / Reset 4 modes	Y	Y	N	N	N	N
Scale Input Count at Z Gate / Reset	N	N	Y	Y	N	N
Z Gate / Reset Invert Bit	Y	Y	Y	Y	N	N
Enable /Force Outputs	Y	Y	Y	Y	Y	Y
Assign Outputs	Y	Y	Y	Y	Y	Y
Operate Outputs (Based On)	Y (Count)	Y (Count)	Y (Count)	Y (Count)	Y (Count)	Y (PWM Value)
Sample Period	N	N	N	N	Y	Y

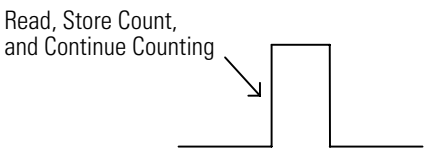
Operating Mode Features

The Z Gate/Reset Terminal will operate in one of four modes when the Store Count feature is in use. The four figures below detail the operation in each mode.

Store Count Mode 1: Store/Continue

In mode 1, the rising edge of a pulse input on the Z Gate/Reset terminal will cause the current counter value to be read and stored in the Read Data file. The counter will continue counting. The stored count will be available in the Stored/Accumulated Count word. The stored count information will remain until it is overwritten with new data.

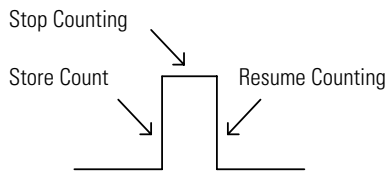
Store/Continue



Store Count Mode 2: Store/Wait/Resume

In mode 2, the rising edge of a pulse input on the Z Gate/Reset terminal will read and store the current counter value in the Stored/Accumulated Count word and inhibit counting while the Z Gate/Reset terminal is high. Counting resumes on the falling edge of the pulse at the Z Gate/Reset terminal. The stored count information will remain until it is overwritten with new data.

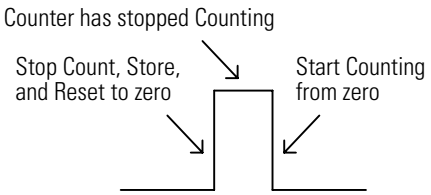
Store/Wait/Resume



Store Count Mode 3: Store-Reset/Wait/Start

In mode 3, the rising edge of a pulse input on the Z Gate/Reset terminal will stop counting, read and store the current counter value in the Stored/Accumulated Count word, and reset the counter to zero. The counter does not count while the input pulse on the Z Gate/Reset terminal is high. Counting resumes from zero on the falling edge of the pulse at the Gate/Reset terminal. The stored count information will remain until it is overwritten with new data.

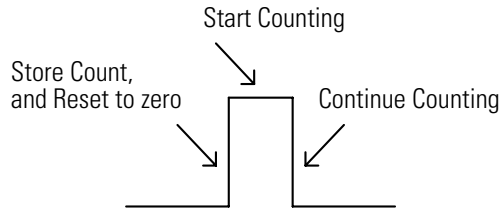
Store-Reset/Wait/Start



Store Count Mode 4: Store-Reset/Start

In mode 4, the rising edge of a pulse input on the Z Gate/Reset terminal will store the current counter value in the Stored/ Accumulated Count word and reset the counter to zero. The counter will continue counting while the Z Gate/Reset terminal is high. The stored count information will remain until it is overwritten with new data.

Store-Reset/Start

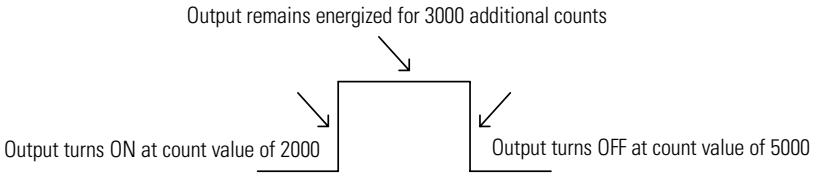


Output Control

To connect an output to a compare window, the user could program the module accordingly:

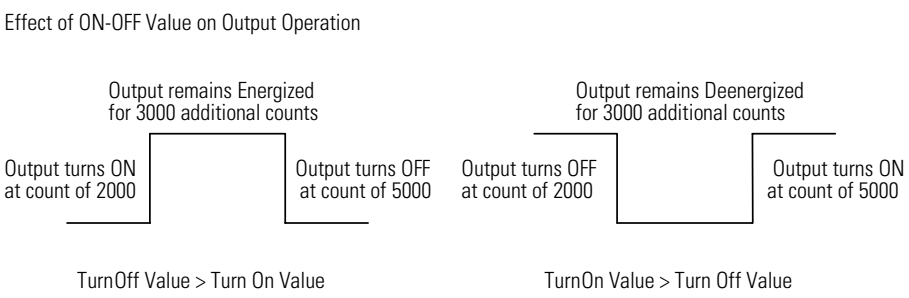
- Tie Output 0 to Window 0
- Program Window 0 ON Value to 2000
- Program Window 0 OFF Value to 5000

ON-OFF Operation of Output 0


Output remains energized for 3000 additional counts
Output turns ON at count value of 2000
Output turns OFF at count value of 5000

If the OFF value is greater than the ON value, the output turns ON at 2000 and OFF at 5000. If the ON value is greater than the OFF value, the output turns OFF at 2000 and ON at 5000.

Effect of ON-OFF Value on Output Operation


Effect of ON-OFF Value on Output Operation
Output remains Energized
for 3000 additional counts
Output turns ON
at count of 2000
Output turns OFF
at count of 5000
TurnOff Value > Turn On Value
Output remains Deenergized
for 3000 additional counts
Output turns OFF
at count of 2000
Output turns ON
at count of 5000
TurnOn Value > Turn Off Value

Chapter Summary

In this chapter, you learned about the kinds of very high speed counter modules, and what modes they operate in. Read chapter 2 to install your counter module.

Installing the Very High Speed Counter Module

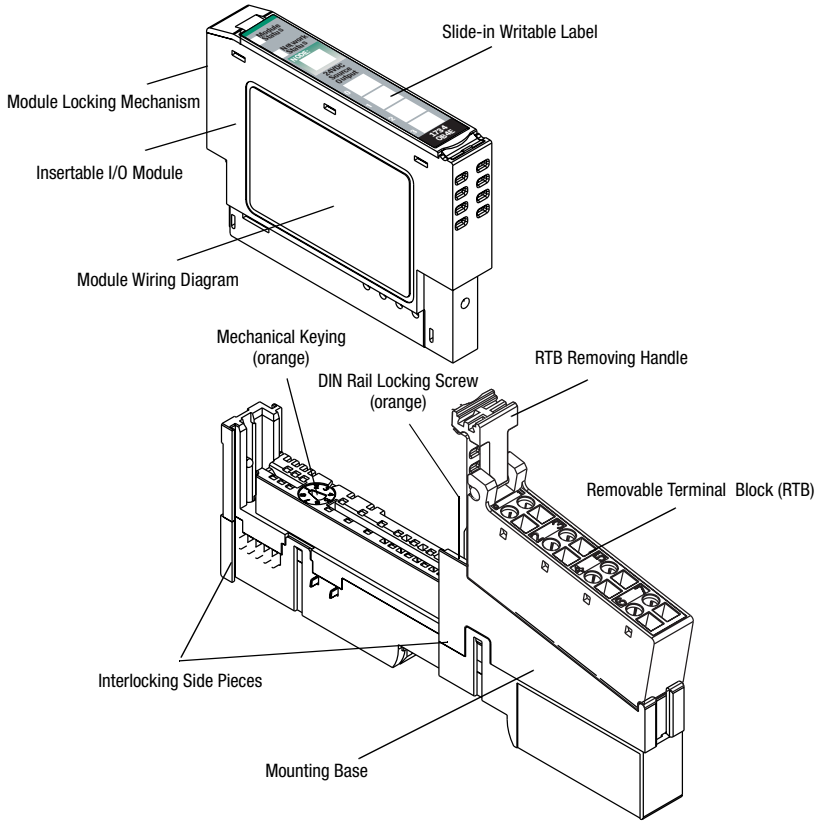
General

The 1734-VHSC is a two-module set. Module 1 houses the 1734-VHSC functionality while module 2 provides screw terminals necessary to access chassis ground (Chas Gnd) and common (C). Module 2 also connects terminal 4 to 5 and terminal 6 to 7 for ease of wiring power to the input device. Module 2 is not necessary for VHSC functionality but eases customer wiring. Module 2 does not use a node address, and it doesn't consume power from the PointBus. To reduce loop area, place module 2 adjacent (either side) to module 1

Installing the Mounting Base/ Wiring Base Assembly

The wiring base assembly (1734-TB or -TBS) consists of a mounting base (cat. no. 1734-MB) and a removable terminal block (cat. no. 1734-RTB or -RTBS). You can install the assembly, or just the mounting base. To install the mounting base/wiring base assembly on the DIN rail, proceed as follows.

1. Position the mounting base/wiring base assembly vertically above the installed units (adapter, power supply or existing module).
2. Slide the mounting base down allowing the interlocking side pieces to engage the adjacent module or adapter.



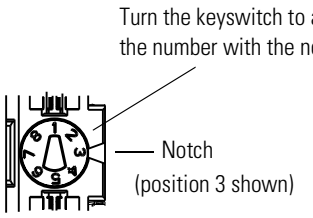
3. Press firmly to seat the mounting base on the DIN rail. The mounting base will snap into place.
4. To remove the mounting base from the DIN rail, remove any installed module (and any module immediately to the right), and use a small bladed screwdriver to rotate the DIN rail locking screw to a vertical position. This releases the locking mechanism. Then lift straight up to remove the mounting base.
5. Repeat this procedure for the next mounting base assembly.

Installing an I/O Module

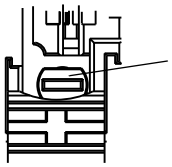
The module can be installed before, or after base installation. Make sure that the mounting base is correctly keyed before installing the module into the mounting base. In addition, make sure the mounting base locking screw is positioned horizontal referenced to the base.

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise till the number required for the type of module being installed aligns with the notch in the base.

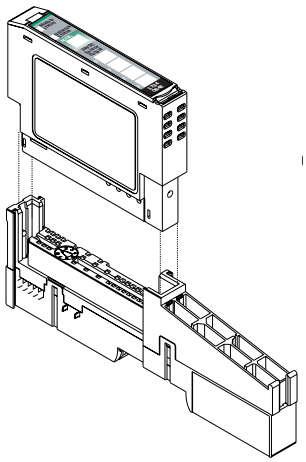
1734-VHSC24 - Position 2
1734-VHSC5 - Position 2



2. Make certain the DIN rail locking screw is in the horizontal position. (You cannot insert the module if the locking mechanism is unlocked.)



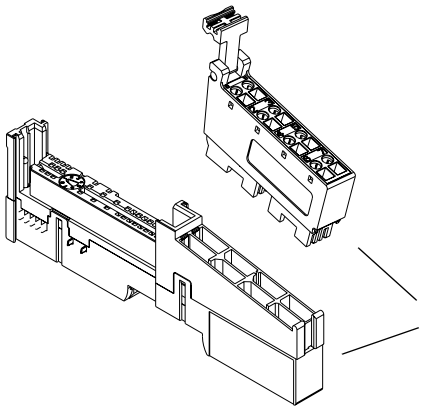
3. Insert the module straight down into the mounting base and press to secure. The module will lock into place.



Installing the Removable Terminal Block

A removable terminal block is supplied with your mounting base assembly. To remove, pull up on the RTB handle. This allows the base to be removed and replaced as necessary without removing any of the wiring. To reinsert the removable terminal block, proceed as follows.

1. Insert the RTB end opposite the handle into the base unit. This end has a curved section that engages with the mounting base.



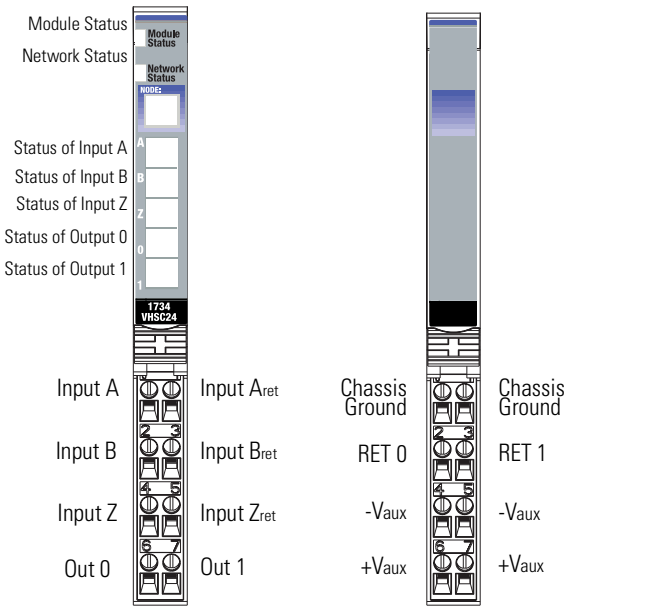
2. Rotate the terminal block into the mounting base until it locks itself in place.
3. If an I/O module is installed, snap the RTB handle into place on the module.

Removing a Mounting Base

To remove a mounting base, you must remove any installed module, and remove the removable terminal block (if wired).

1. Unlatch the RTB handle on the I/O module.
2. Pull on the RTB handle to remove the removable terminal block.
3. Press in on the module lock on the top of the module and pull up on the
   I/O module to remove from the base.
4. Remove the module to the right of the base you are removing. (The interlocking portion of the base sits under the adjacent module.)
5. Use a small bladed screwdriver to rotate the orange DIN rail locking screw on the mounting base to a vertical position. This releases the locking mechanism.
6. Then lift the mounting base straight up to remove.

Wiring the 24V dc Very High Speed Counter Module



Module 1		Module 2	
0 A	1 Aret	0 Chas Gnd	1 Chas Gnd
2 B	3 Bret	2 RET 0	3 RET 1
4 Z	5 Zret	4 -Vaux	5 -Vaux
6 Out 0	7 Out 1	6 +Vaux	7 +Vaux

Module 1 Terminations		Module 2 Terminations	
0	A	0	Chassis ground
1	Aret	1	Chassis ground
2	B	2	Out 1 RET
3	Bret	3	Out 0 RET
4	Z	4	Vaux -
5	Zret	5	Vaux -
6	Out 0	6	Vaux +
7	Out 1	7	Vaux +

Chapter Summary

In this chapter, you learned how to install your module and mounting base assembly. You also learned how to wire your module.

Very High Speed Counter Module Input and Output Data

In This Chapter

In this chapter, you will learn about the input/output data table of your 1734-VHSC24 and -VHSC5.

For more information about:	See page:
Data Table	3-1
Detailed Description of Data Table Information	3-2
Output Data	3-5
Configuration Data	3-6
Communicating Real Time/Non-real Time Information	3-11

Data Table

The following table shows the complete format of the input/output data.

		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	0
	Input Information																
	Present Channel Data	32-bit Value of the present counter state															
	Stored Channel Data	32-bit value of the stored/accumulated count															
	Status	PE	EF	NR	0	FS	FS	OS	OS	0	ZS	BS	AS	C1	C0	ZD	0
	Programming Error Code	PE	0	0	0	0	E10	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0
	Output Information																
	Counter Control									0	0	0	0	0	VR	CP	CR
	Output Control									DS	ES	OE	FO	DS	ES	OE	FO
	PWM Value	16-bit decimal value with range from 0-9500 (0-95.00%)															
	Configuration Information																
	Counter Configuration									ZI	MD	MD	MD	CF	CF	CF	CF
	Filter Selection									0	ZF	BF	AF	FS	FS	FS	FS
	Decimal Position	8-bit value used to modify the present channel data display															
	Active Output Assembly									Assembly number (0, 105 or 106)							
	Time Base/PWM Period	16-bit value used to set the time base or PWM period															
	Gate Interval	8-bit value used to set the gate interval															

		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	0
	Scalar	8-bit value used to divide the Z input by 2^n															
	Output Ties 0									0	0	0	0	T3	T2	T1	T0
	Output Ties 1									0	0	0	0	T3	T2	T1	T0
	Rollover Value	32-bit value at which the counter is commanded to rollover															
	Preset Value	32-bit value the counter is to be set to when CP is asserted															
	On Value 1	32-bit value that sets the compare window															
	Off Value 1	32-bit value that sets the compare window															
	On Value 2	32-bit value that sets the compare window															
	Off Value 2	32-bit value that sets the compare window															
	On Value 3	32-bit value that sets the compare window															
	Off Value 3	32-bit value that sets the compare window															
	On Value 4	32-bit value that sets the compare window															
	Off Value 4	32-bit value that sets the compare window															
	PWM Safe State Value	16-bit safe state value for the PWM signal															
	Counter Control SS Value									0	0	0	0	0	VR	CP	CR
	Output Control SS Value									DS	ES	OE	FO	DS	ES	OE	FO

Detailed Description of Data Table Information

Present Channel Data (Input Word 1)

This is a 32 bit unsigned long word value representing the current count of the 24 bit counter *(configurations: count [0], x1 encoder [1], x2 encoder [2], PWM [3], x4 encoder [4])* **or** the frequency *(configurations: period/rate [5], continuous/rate [6], rate measurement [7])*. The range of values is 0 ≤ value ≤ 0x00FFFFFF (16,777,215).

Stored/Accumulated Channel Data (Input Word 2)

This is a 32 bit unsigned long word value representing the stored count of the counter at the time of some specified event. In counter configurations *(configurations: count [0], x1 encoder [1], x2 encoder [2], x4 encoder [4])* without store modes selected, these words are not updated. With store modes selected, they are the stored value of the counter at the time of the specified event (ex: rising edge of Z input). In *PWM [3]* configuration it is the counter value at the end of the period specified by the product of the time base x gate interval. In *period/rate [5]* and *continuous/rate [6]* configurations it is the total accumulation of unscaled Z pulses (i.e. if scaling is set to 128, after 128 Z pulses the accumulator will increase by 128 counts).

The maximum frequency that accumulation can follow in these two modes is 200Hz x scalar value (ex: 200Hz x 128 is 25kHz). Finally, in

rate measurement [7] configuration, it is the total number of pulses seen at the A input accumulated over each period as specified by the product of the time base x gate interval. The range of values occupy the entire 32 bit size from 0 ≤ value ≤ 0xFFFFFFFF (4,294,967,295). Changing the configuration does not clear these words.

Module/Channel Status and Programming Error Codes (Input Words 3 and 4)

Programming Error bit (PE) - If an incomplete, incorrect or conflicting set of configuration parameters are sent to the module, the PE bit will be asserted and an error code will be placed in the Programming Error Code word (assembly 68_{16}). The module will **not** enter a normal operational state.

Bit definitions for the error code are:

E10: An invalid assembly was chosen for poll consumption (0, 105 or 106 are valid).

E9: The decimal point position is outside of acceptable range.

E8: Counter 0 window ON & OFF values are equal and not zero OR Counter 0 window ON or OFF value greater than 0x00FFFFFF.

E7: A tie has been connected to an unprogrammed window.

E6: A configuration was selected that requires the scalar and none was programmed OR Multiple scalars were selected.

E5: The preset is out of range (> 0x00FFFFFF).

E4: A rollover of zero was programmed though PWM was not selected OR A rollover was programmed and PWM was selected OR Rollover is out of range (> 0x01000000).

E3: A configuration requiring time base was selected and no gate interval was set OR Gate interval is out of range (> 200) OR Product of time base and gate interval is greater than 3 seconds.

E2: A time base was entered that is not a multiple of 10 OR Time base is out of range (> 3000, i.e. 3 seconds).

E1: ZF/BF/AF were selected and no filter was programmed OR Multiple filters were selected.

E0: A reserved configuration/mode was programmed.

EEPROM Fault status bit (EF) - If a fault is detected with the EEPROM during power up tests, this bit is asserted to 1. It indicates that the content of the EEPROM has been corrupted, most likely caused by loss of power during an executing write.

Not Ready status bit (NR) - Whenever power is applied to the module, the hardware must be initialized. During this time, the NR bit will be asserted and the **green module status indicator will flash**.

Output Fault Status indicators (FS) - where bit 11 is output 1 and bit 10 is output 0. A 1 indicates the output is either shorted or open.

Output Status indicators (OS) - where bit 9 is output 1 and bit 8 is output 0. A 1 indicates the output is ON, 0 it is OFF.

Z input Status (ZS) - This bit indicates the present status of the Z input (1 indicates Z is ON, 0 indicates Z is OFF). This bit is unaffected by Z Invert, ZI, in the Counter Configuration word.

B input Status (BS) - This bit indicates the present status of the B input (1 indicates B is ON, 0 indicates B is OFF).

A input Status (AS) - This bit indicates the present status of the A input (1 indicates A is ON, 0 indicates A is OFF).

C[1,0] Stored data count - This count cycles through [0 0], [0 1], [1 0], [1 1], [0 0]... Each time the stored/accumulated count words are updated, C[1,0] is incremented. This feature assumes the host's sample rate (including network delay and program scan) is as fast or faster than the frequency of the event which updates C[1,0].

Zero frequency Detected (ZD) - This bit is operational when frequency configurations are programmed *(configurations: period/rate [5], continuous/rate [6], rate measurement [7])*.

In ***period/rate [5]*** **and** ***continuous/rate [6]*** configurations, counts are acquired during the **ON** state of the Z input. At very low frequencies the counter saturates, indicating a zero frequency detect. The time it takes to determine a zero frequency in these two configurations can be as long as 6.7 seconds (16,777,216 counts x 1/5MHz x 2 half cycles of Z).

In ***rate measurement [7]*** configuration pulses on the A input are counted over a sample interval specified by the time base. The time it takes to determine a zero frequency in this configuration will be determined by the sample interval (ex: time base = 0.300 second ∴ 300 milliseconds to determine ZF).

Output Data

Counter Control (Word 1)

VR Value Reset of stored/accumulated count. The transition of this bit from 0 to 1 clears the stored/accumulated count word.

CP Counter Preset. The transition of this bit from 0 to 1 sets the counter to the value specified by the Preset words. Outputs are adjusted according to the window compare values.

CR Counter Reset. The transition of this bit from 0 to 1 clears the counter. Outputs are adjusted according to the window compare values.

Output Control (Word 2)

Diagnostic speed (DS) - When this bit is set (1), the short circuit and open wire diagnostics will be filtered (50ms) to prevent nuisance trips caused by noisy environments. When the bit is reset (0), diagnostics responds to a fault condition in less than 8ms.Bits 7 and 3 report output 1 and 0 respectively.

Electronic-fuse Select (ES) - When this bit is set (1), outputs will be disabled upon the detection of a fault (short circuit or open wire) and the output fault status indicator, FS, will be latched. Recovery from a faulted state is achieved by sending ES = 0 and OE = 1 for the afflicted output. When ES equals zero, a faulted output will continue to operate as instructed until the fault is removed. In either case, FS is asserted to indicate a fault. Bits 6 and 2 report output 1 and 0 respectively.

Output Enable (OE) - When this bit is set (1), outputs are permitted to turn on from either a force on, FO, a compare match or as directed by the PWM settings. When OE equals zero, the module turns the associated output OFF. Bits 5 & 1 represent outputs 1 & 0 respectively.

Force Output (FO) - When this bit is set to 1, outputs are turned on if OE is 1. When FO equals zero, outputs may then be controlled by a compare match or as directed by the PWM settings. Bits 4 & 0 represent outputs 1 & 0 respectively.

Pulse Width Modulation (PWM) Value (Output Word 3)

When the module is programmed for a *PWM [3]* configuration, the time base is enabled, the counter, rollover the 1st ON and 1st OFF value for the respective channel are used. Ties can be used to direct the PWM signal to any or both outputs. The range of PWM values is 0 ≤ value ≤ 9500 decimal (i.e. 0.00% ≤ value ≤ 95.00%). Entering a value "below" 0 will result in a PWM of 0%; a value greater than 9500 will result in a PWM of 95.00%. The actual duty cycle observed at the output will depend on the turn on and turn off times of the MOSFET, the energy storage capability of the cable/load and the resistance from output to return.

Configuration Data

The following represents the configuration data used by the 1734-VHSC24 module.

Counter Configuration (Configuration Word 1)

Use this byte to select the type of counter desired.

07	06	05	04	03	02	01	00	
ZI	**MD**			**CF**				**Counter 0**
				0	0	0	0	Counter
				0	0	0	1	Encoder X1
				0	0	1	0	Encoder X2
				0	0	1	1	PWM
				0	1	0	0	Encoder X4
				0	1	0	1	Period/Rate
				0	1	1	0	Continuous/Rate
				0	1	1	1	Rate Measurement
	0	0	0					Store Count Disabled
	0	0	1					Mode 1 - store/continue
	0	1	0					Mode 2 - store/wait/resume
	0	1	1					Mode 3 - store, reset/wait/start
	1	0	0					Mode 4 - store, reset/start
	1	0	1					Reserved
	1	1	0					Reserved
	1	1	1					Reserved
0								Z input - 0 = not inverted
1								Z input - 1 = inverted

Filter Selection (Configuration Word 2)

This byte sets the A/B/Z input filters

Filter Selection

07	06	05	04	03	02	01	00	
0	**ZF**	**BF**	**AF**	**FS**				
				0	0	0	0	No Filter
				0	0	0	1	50kHz (10µs + 0µs/-1.6µs)
				0	0	1	0	5kHz (100µs + 0µs/-13.2µs)
				0	1	0	0	500Hz (1.0ms + 0µs/-125µs)
				1	0	0	0	50Hz (10ms + 0ms/-1.25ms)
			0					A input not filtered
			1					A input filtered
		0						B input not filtered
		1						B input filtered
	0							Z input not filtered
	1							Z input filtered

Decimal Position (Configuration Word 3)

This byte changes the significant digits of the frequency or counter display.

In the frequency modes (*period/rate [5]*, *continuous/rate [6]*, *rate measurement [7]*) for example, a -2 will move the decimal point left 2 places, dividing the frequency value by 100, a +1 moves it right, multiplying by 10. The firmware checks for placement to be in the range $-4 \leq$ value $\leq +2$. A value outside the range will move the decimal point to the zero position and assert the programming error (PE) bit. Moving the decimal point to the left (i.e. negative), allows high frequencies, commonly present in rate measurement mode, to fit within a single 16 bit word. Moving the decimal point to the right (i.e. positive), allows low frequencies, commonly present in period and continuous rate modes, to have resolution displayed to 0.1Hz and 0.01Hz. Frequencies should be kept below 3.2kHz for 0.1Hz resolution and below 320Hz for 0.01Hz. Scalars of Z/128, Z/64, Z/32 and Z/16 should *not* be used when positioning is applied. 0 is the default setting.

In the counter modes (*counter [0], x1 encoder [1], x2 encoder [2], pwm [3], x4 encoder [4]*), it attenuates the counter display, for example, 20 divides count+1 by 20. The value may be in the range 0 < value ≤ 255. The result of requesting a number other than 1 performs the function: (COUNT + 1) / ATTENUATION. This is useful for scaling a large counter value to a smaller 16 bit value or a percentage. 1 is the default setting and zero reverts to 1 to prevent a divide by zero.

Active Output Assembly (Configuration Word 4)

This byte permits selection of either assembly 105 (0x69 - Counter/ Output Control) or 106 (0x6A - PWM Value) for poll consumption. Entering a zero will cause the default assembly, 105, to be selected.

Time Base/Pulse Width Modulation (PWM) Period (Configuration Word 5)

This word sets the fundamental time base for the counter. Its resolution is in milliseconds with minimum 10ms intervals (i.e. an interval of 10 milliseconds is a value of 10, 1 second is 1000). The maximum value that may be programmed is 3 seconds (3000). The time base must be entered when the *PWM [3]* and *rate measurement [7]* configurations are used.

Gate Interval (Configuration Word 6)

This byte sets the counter's gate interval using the time base setting as its time unit. (i.e. its resolution is determined by the time base). The actual gate interval is the product of the time base and the gate interval (ex: 50ms gate interval may be produced with a time base of 10 and a gate interval of 5 or a time base of 50 and a gate interval of 1). The maximum value of the product of time base x gate interval is 3 seconds. The gate interval must be entered when the *PWM [3]* and *rate measurement [7]* configurations are used. The maximum value is 200.

Scalar (Configuration Word 7)

This byte scales the Z signal in the *period/rate [5]* and *continuous/rate [6]* configurations. If the filter is applied, then the filtered Z is scaled. Only one bit of the scalar should be set. Selecting a scalar will cause accumulated counts to be adjusted accordingly (i.e. selecting a scalar of 128 will increase the accumulated count by 128 after 128 Z pulses have been received*).* ***It is highly recommended that anytime Z is scaled (divide by 2, 4, 8, etc), the Z input should be filtered, otherwise, noise could cause erroneous frequency readings.***

Scalar Selection

07	06	05	04	03	02	01	00	Scalar[1]
0	0	0	0	0	0	0	1	Z - F_{min} = 0.149Hz
0	0	0	0	0	0	1	0	Z/2 - F_{min} = 0.298Hz
0	0	0	0	0	1	0	0	Z/4 - F_{min} = 0.596Hz
0	0	0	0	1	0	0	0	Z/8 - F_{min} = 1.192Hz
0	0	0	1	0	0	0	0	Z/16 - F_{min} = 2.384Hz
0	0	1	0	0	0	0	0	Z/32 - F_{min} = 4.768Hz
0	1	0	0	0	0	0	0	Z/64 - F_{min} = 9.537Hz
1	0	0	0	0	0	0	0	Z/128 - F_{min} = 19.073Hz

1 Where F_{min} indicates the frequency at which the zero frequency detect is asserted due to counter overflow.

Output 0-1 Ties (Configuration Words 8 and 9)

The bits in these two bytes connect the specified output to the appropriate compare window. There are 4 windows associated with the counter. Each output may be connected to any number of windows, from 1 to all 4. The bits are defined as follows:

T0 - Tie Output to 1st Compare Window (also the PWM signal in *PWM [3]* configuration)

T1 - Tie Output to 2nd Compare Window

T2 - Tie Output to 3rd Compare Window

T3 - Tie Output to 4th Compare Window

Rollover (Configuration Word 10)

This long word sets the number of counts the counter will accumulate before rolling over. For example, a value of 1000 will produce a count sequence of: 998, 999, 0, 1, 2… while incrementing or 2, 1, 0, 999, 998… while decrementing. Rollover is a 32 bit number with a useable range of 1 ≤ value ≤ 0x01000000 (16,777,216). In *PWM [3]* configuration, this value should be zero; in *count [0], x1 encoder [1], x2 encoder [2] and x4 encoder [4]* configurations, it should be specified to some non-zero value; and in *period/rate [5], continuous/ rate [6]* and *rate measurement [7]* configurations is a 'don't care'.

Preset (Configuration Word 11)

This long word sets the preset value the counter will be loaded with, when a Counter Preset, CP, command is issued. Preset is a 32 bit number with a range of 0 ≤ value ≤ 0x00FFFFFF (16,777,215).

Counter ON and OFF Windows (Configuration Words 12 to 19)

These long words program the four compare window's ON and OFF values. The first compare window for each counter is utilized in *PWM [3]* configuration and, when PWM is programmed for a channel, the associated compare window should remain at 0. The range of each entry is 0 ≤ value ≤ 0x00FFFFFF (16,777,215). When a tie is connected to a compare window, that window must be specified (i.e. ON value ≠ OFF value ≠ 0). These Windows are always interpreted as counts, regardless of the configuration setting and may be computed as follows for frequency modes *5, 6 & 7*:

Period/Rate (5) and Continuous Rate

counts = (scalar x 2.5E6) / desired_frequency

Rate Measurement

counts = time_base [sec] x gate_interval x desired_frequency

Safe State Values (Configuration Words 20 through 22)

When either the host transitions to PROGRAM mode or a communication fault (i.e. broken network cable) occurs, the module copies these safe state words (counter control, output control, and PWM value) into its real-time working buffer. The definitions are identical to those described under Real-time Output Data with the following exception: entering a PWM Safe State value outside of the range, 0-9500, will result in a **Hold Last State** to be executed.

Communicating Real Time/ Non-real Time Information

The Very High Speed Counter Module uses several words to communicate real time input and output data as well as non-real time module information (i.e. description, revision, etc) and configuration.

Assembly 101 is produced for a polled connection. Assembly 102 is produced for a Change Of State (COS) connection. Assemblies 103, 104, 107 and 108 are by Explicit message only. Assemblies 105 and 106 are consumed in a polled connection (as directed by parameter 4).

Data may be read (get) or written (set) using an Explicit Message. For example, to read the Present Channel Data, assembly 101_{10} (65_{16}) can be requested. The following table shows the words which can be exchanged.

Instances	Services	Field	Bytes
#101 (0x65)	Get	Present Channel Data	4
		Status	2
#102 (0x66)	Get	Stored Channel Data	4
		Status	2
#103 (0x67)	Get	Present Channel Data	4
		Stored Channel Data	4
		Status	2
#104 (0x68)	Get	Programming Error Code	2
#105 (0x69)	Set/Get	Counter Control	1
		Output Control	1
#106 (0x6a)	Set/Get	PWM Value	2
#107 (0x6b)	Set/Get	PWM Value	2
		Counter Control	1
		Output Control	1

Table continued on next page.

#108 (0x6c)	Set/Get	Counter Configuration	1
		Filter Selection	1
		Decimal Position	1
		Active Output Assembly	1
		Time Base or PWM Period	2
		Gate Interval	1
		Scalar	1
		Output 0 Ties	1
		Output 1 Ties	1
		Rollover Value	4
		Preset Value	4
		ON Value # 1	4
		OFF Value #1	4
		ON Value # 2	4
		OFF Value #2	4
		ON Value # 3	4
		OFF Value #3	4
		ON Value # 4	4
		OFF Value #4	4
		PWM Safe State Value	2
		Counter Control SSV	1
		Output Control SSV	1

Configuring Your Very High Speed Counter Module

This chapter describes how to configure your Very High Speed Counter modules with RSNetworx.

For more information about:	See page:
Configuration Overview	4-1
Adding the Adapter to Your Network	4-1
Adding I/O Modules to Your Network	4-2
Setting the Counter's Parameters	4-4
Checking I/O Status and Viewing/Editing the EDS File	4-6

Configuration Overview

You must use the RSNetworx for DeviceNet software to configure your module. You can configure the module while it is:

- online

  or
- offline

This chapter shows configuration in the online mode. Configuration screens appear similar in both modes. The primary difference is that if you make changes offline, you must go online before the configuration changes take effect.

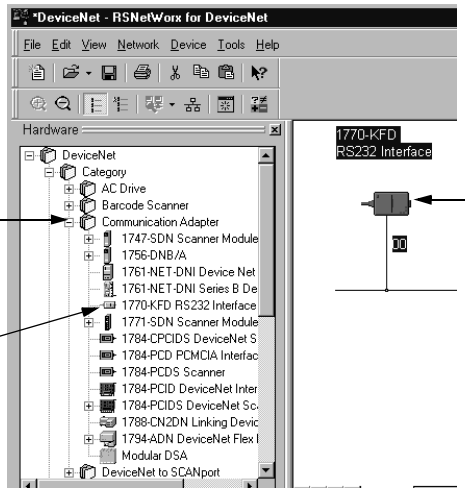
Adding the Adapter to Your Network

Follow these steps:

1. Start the RSNetworx for DeviceNet software.

2. Add the communication device as shown below. (In this case, the chosen device was a 1770-KFD RS232 Interface.)

1. Click here to expand the list of communication adapters.
2. Double-click here to choose the scanner. You can also click and drag the scanner name onto the network. Make sure you choose the 1734-ADN Point I/O Scanner.



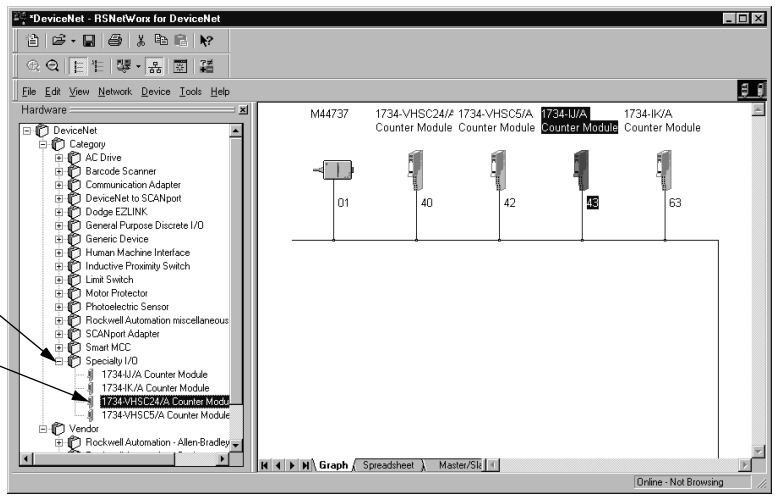
IMPORTANT The scanner must always exist on the DeviceNet network at Node 00.

Adding I/O Modules to Your Network

After you add the communication device, you must add the POINT I/O modules connected to the scanner on the PointBus.

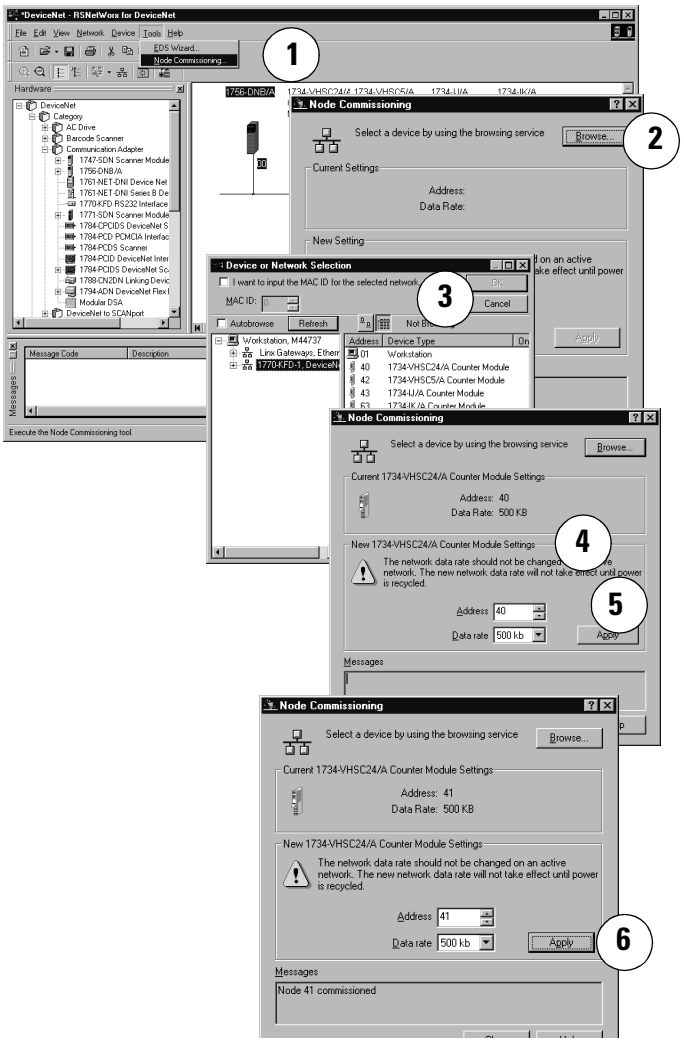
1. Add modules as shown below. .

1. Click here to expand the list of Specialty modules.
2. Double-click on the catalog number to choose the module. You can also click and drag the module name onto the network.



The out-of-the-box node setting for 1734 modules is 63. You can change the setting by using the node commissioning tool. The node commissioning tool is available either online or offline.

IMPORTANT If you commission a node online, you must power down your system before the change takes place.



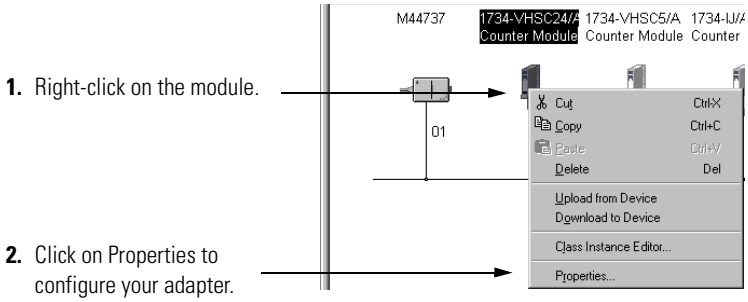
1. Go to the pulldown Tools. Select Node Commissioning.
2. Click on Browse.
3. Select the module to change.
4. The node commissioning screen returns. It displays the node number and data rate.
5. Change the node number and Apply. The screen will then identify the new setting.
6. Click on Close to continue.

Setting the Counter's Parameters

After adding the module to the network, you must configure the modules for use .

IMPORTANT This chapter shows configuration in the online mode. Changes set in this mode take effect when you download to the individual module.

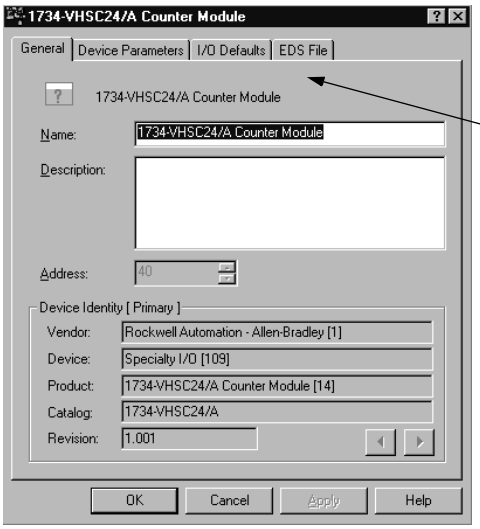
1. Configure the modules as shown below.



1. Right-click on the module.
2. Click on Properties to configure your adapter.

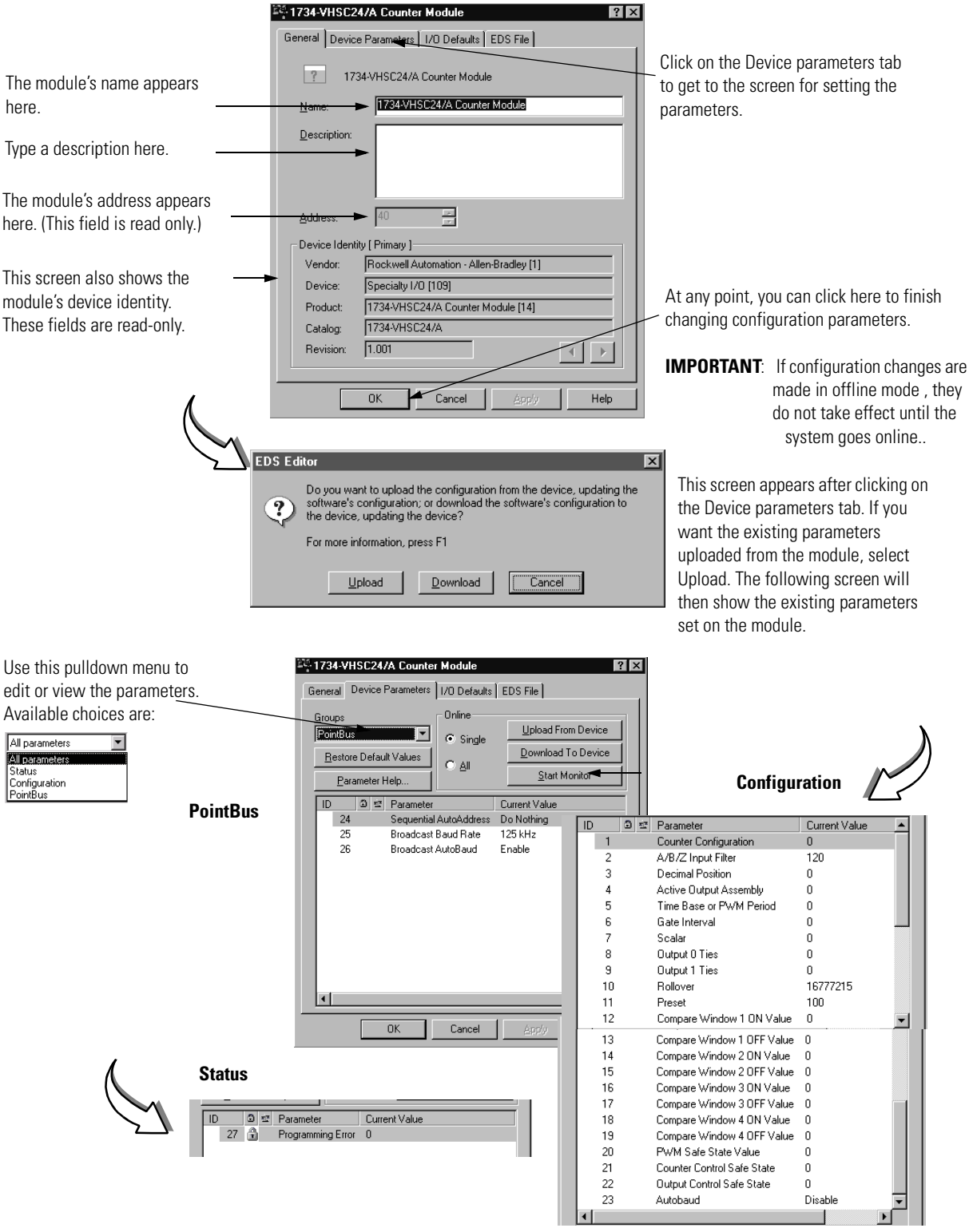
You can also left click on the module or name and the property screen will pop up.

You will see a pop-up screen with a series of tabs. Each tab provides options view or edit. The tabs are shown below and on the following pages. These screens are for the 1734-VHSC24 module. Identical screens are used for the 1734-VHSC5 module



These are the tabs you click on to view the options.

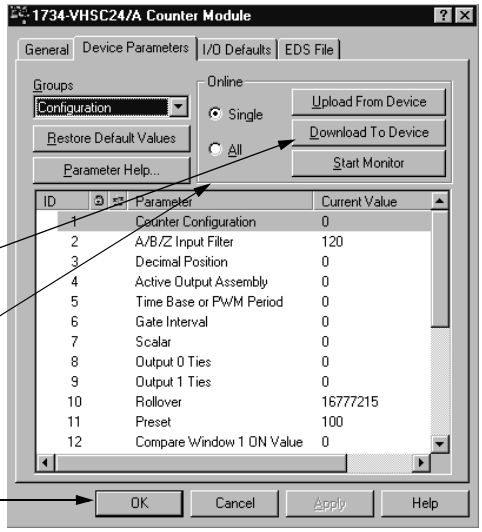
Refer to the screens below for an explanation of its features..


The module's name appears here.
Type a description here.
The module's address appears here. (This field is read only.)
This screen also shows the module's device identity. These fields are read-only.
Click on the Device parameters tab to get to the screen for setting the parameters.
At any point, you can click here to finish changing configuration parameters.
IMPORTANT: If configuration changes are made in offline mode , they do not take effect until the system goes online..
This screen appears after clicking on the Device parameters tab. If you want the existing parameters uploaded from the module, select Upload. The following screen will then show the existing parameters set on the module.
Use this pulldown menu to edit or view the parameters. Available choices are:
All parameters
Status
Configuration
PointBus
PointBus
Configuration
Status
1734-VHSC24/A Counter Module
General
Device Parameters
I/O Defaults
EDS File
Name:
Description:
Address:
Device Identity [Primary]
Vendor:
Device:
Product:
Catalog:
Revision:
OK
Cancel
Apply
Help
EDS Editor
Do you want to upload the configuration from the device, updating the software's configuration; or download the software's configuration to the device, updating the device?
For more information, press F1
Upload
Download
Cancel
Groups
PointBus
Online
Single
All
Upload From Device
Download To Device
Start Monitor
Restore Default Values
Parameter Help...
ID
Parameter
Current Value
24 Sequential AutoAddress Do Nothing
25 Broadcast Baud Rate 125 kHz
26 Broadcast AutoBaud Enable
1 Counter Configuration 0
2 A/B/Z Input Filter 120
3 Decimal Position 0
4 Active Output Assembly 0
5 Time Base or PWM Period 0
6 Gate Interval 0
7 Scalar 0
8 Output 0 Ties 0
9 Output 1 Ties 0
10 Rollover 16777215
11 Preset 100
12 Compare Window 1 ON Value 0
13 Compare Window 1 OFF Value 0
14 Compare Window 2 ON Value 0
15 Compare Window 2 OFF Value 0
16 Compare Window 3 ON Value 0
17 Compare Window 3 OFF Value 0
18 Compare Window 4 ON Value 0
19 Compare Window 4 OFF Value 0
20 PWM Safe State Value 0
21 Counter Control Safe State 0
22 Output Control Safe State 0
23 Autobaud Disable
27 Programming Error 0

To configure your module, select Configuration and modify the parameters as desired for your application.

When complete, download to your module by clicking on the Download to Device button. You can download each change as you make it using "Single," or download all your changes using "All."

Click here when finished.

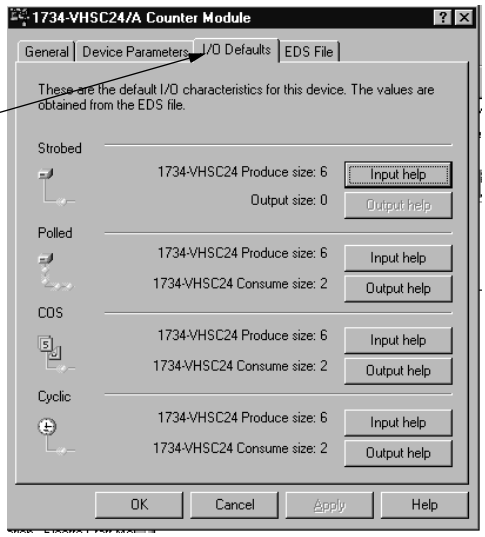


Checking I/O Status and Viewing/Editing the EDS File

You can view the I/O defaults setup, and the EDS file by clicking on the appropriate tab.

Click on the I/O Defaults tab to display the default characteristics for this module.

This screen shows the input/output defaults for the four modes. These are:
Strobe
Polled
Change of state and
Cyclic



Click on the EDS File tab to display the statistics of the EDS file used to configure this

Click on View File to view the actual EDS file (shown at the left).

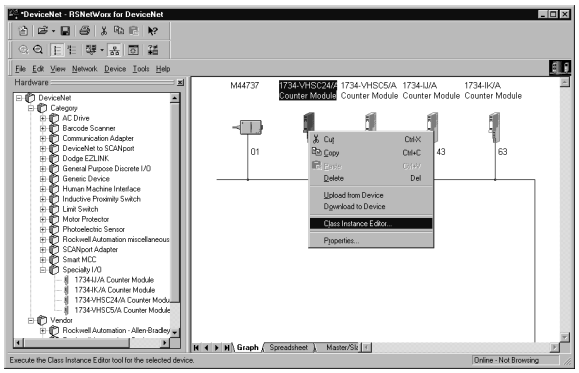
You can view the actual EDS file or edit the file.

Accessing Instantiated Instances

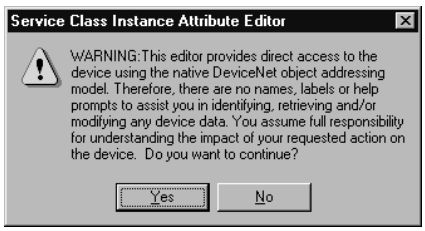
In This Chapter

In this chapter, you will learn how to access imbedded Instantiated Instances (assemblies) in the software. The Very High Speed Counter Module uses several words to communicate real time input and output data as well as non-real time module information (i.e. description, revision, etc) and configuration. These words have been preprogrammed into Instantiated Instances.

Using Instantiated Instances



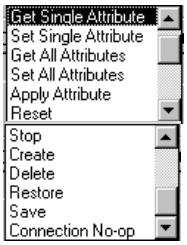
Click on the module to select the Class Instance Editor.


Service Class Instance Attribute Editor
WARNING: This editor provides direct access to the device using the native DeviceNet object addressing model. Therefore, there are no names, labels or help prompts to assist you in identifying, retrieving and/or modifying any device data. You assume full responsibility for understanding the impact of your requested action on the device. Do you want to continue?
Yes
No

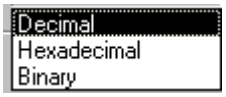
Click on Yes when this screen appears.

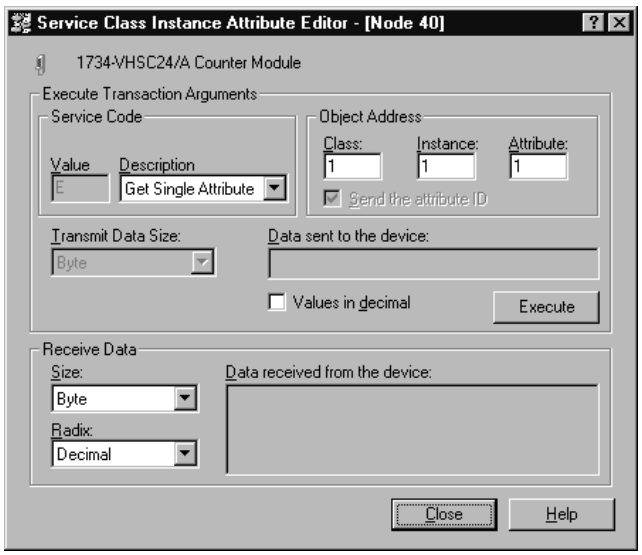
The Class Instance Attribute editor screen will appear.

1. Select the service code



2. Select the Receive Data size and radix.



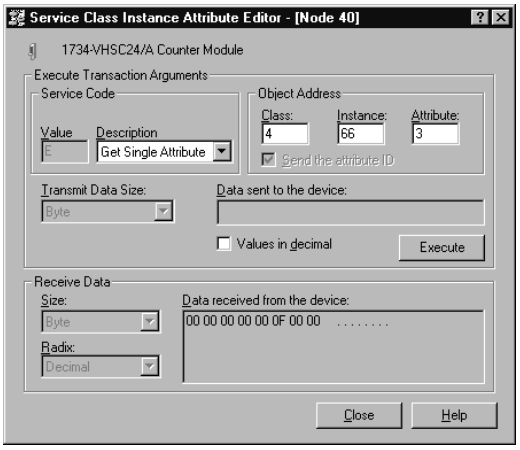


3. Enter the class, instance and attribute here.

4. Click on Execute to initiate the action.

For example:

If you select Instance 101 (polled connection), the screen will look like this.



1. Type in the instance number here. This is an example of assembly number 102 (0x66). (The class is always 4 and the attribute is always 3.)

2. Click on execute.

3. Data received and status information is recorded here.

4. Click on Close to finish.

Assemblies

Available assemblies are:

- Assembly 101 is produced for a polled connection.
- Assembly 102 is produced for a Change Of State (COS) connection.
- Assemblies 103, 104, 107 and 108 are by Explicit message only.
- Assemblies 105 and 106 are consumed in a polled connection (as directed by parameter 4).

Data may be read (get) or written (set) using an Explicit Message. For example, to read the Present Channel Data, assembly 101_{10} (65_{16}) can be requested.

Data is ordered as followed (byte 0 is the least significant byte):

8 bit byte	Byte 0
16 bit word	Byte 0, byte 1
32 bit long word	Byte 0, byte 1, byte 2, byte 3

In this example, assembly 101,

Service	Class	Instance	Attribute
0E (Get)	04 (Assembly)	65 (Present Data)	03 (Data Attribute)

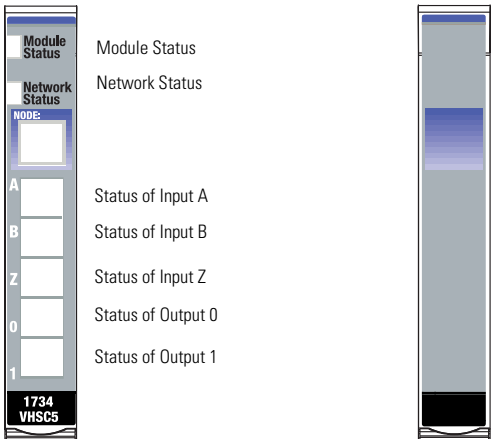
Instances	Services	Field	Bytes
#101 (0x65)	Get	Present Channel Data	4
		Status	2
#102 (0x66)	Get	Stored Channel Data	4
		Status	2
#103 (0x67)	Get	Present Channel Data	4
		Stored Channel Data	4
		Status	2
#104 (0x68)	Get	Programming Error Code	2
#105 (0x69)	Set/Get	Counter Control	1
		Output Control	1
#106 (0x6a)	Set/Get	PWM Value	2
#107 (0x6b)	Set/Get	PWM Value	2
		Counter Control	1
		Output Control	1

#108 (0x6c)	Set/Get	Counter Configuration	1
		Filter Selection	1
		Decimal Position	1
		Active Output Assembly	1
		Time Base or PWM Period	2
		Gate Interval	1
		Scalar	1
		Output 0 Ties	1
		Output 1 Ties	1
		Rollover Value	4
		Preset Value	4
		ON Value # 1	4
		OFF Value #1	4
		ON Value # 2	4
		OFF Value #2	4
		ON Value # 3	4
		OFF Value #3	4
		ON Value # 4	4
		OFF Value #4	4
		PWM Safe State Value	2
		Counter Control SSV	1
		Output Control SSV	1

Troubleshooting with the Indicators

Using the Indicators for Troubleshooting

Each 1734-VHSC very high speed counter module has 7 indicators on the frontplate. Use these indicators for troubleshooting.



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to configuration missing, incomplete or incorrect.
Flashing Red	Recoverable fault.
Red	Unrecoverable fault may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on-line - Device has not completed dup_MAC_id test. - Device not powered - check module status indicator
Flashing Green	Device is on-line but has no connections in the established state.
Green	Device on-line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state
Red	Critical link failure - failed communication device. Device detected error that prevents it communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identify Communication Faulted Request - long protocol message.

Indication	Probable Cause
Input Status	
Off	Input inactive
Yellow	Input is active and under control

Indication	Probable Cause
Output Status	
Off	Output inactive
Yellow	Output is active and under control
Flashing Yellow	Output is toggling
Flashing Red	Output is faulted (open, short or no output power)
Flashing Red/Yellow	Output is toggling and faulted (possibly open)

Specifications

Specifications for the Very High Speed Counter Module, cat. no. 1734-VHSC24

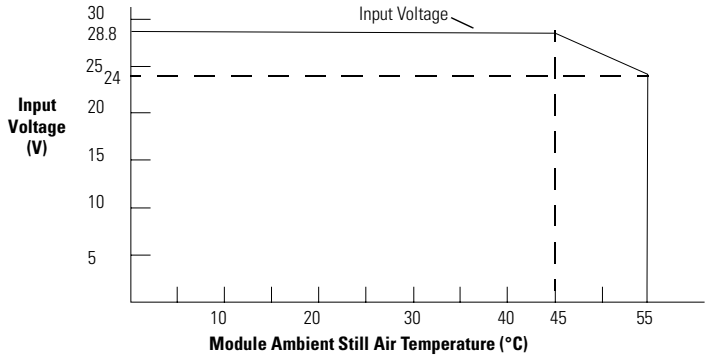
Specifications - 1734-VHSC24 Very High Speed Counter Module	
Input Specifications	
Number of Inputs	1 - 1 group of A/Areturn, B/Breturn and Z/Zreturn
Input Voltage	15-24V dc
Input Current	6.1mA @ 15V dc 10.2mA @ 24V dc
Input OFF-State Current	≤0.250mA max
Input OFF-State Voltage	≤1.8V dc
Input ON-State Current	≥5mA
Input ON-State Voltage	≥12.5V dc
Maximum ON-State Voltage	Refer to derating curve below.
Input Filter Selections	Off 10µs 100µs 1.0ms 10.0ms
Maximum Input Frequency	1.0MHz counter and encoder X1 configurations 500kHz encoder X2 configuration (no filter) 250kHz encoder X4 configuration (no filter)
Output Specifications	
Number of Outputs	1 isolated group of 2 capable of 0.5A @ 24V dc
Output Control	Outputs can be tied to any of 4 compare windows
Output Supply Voltage Range	10-28.8V dc
OFF-State Leakage Current	≤0.5mA
ON-State Voltage Drop	≤0.3V dc @ 0.5A
ON-State Current	0.5A maximum
Short Circuit Current	6A - Outputs are short circuit protected and either cycle until the fault is corrected, or latch off (depending upon programming) Short circuit detected when output is turned on.
Open Wire Detection	Open wire detected when output is turned off
Delay Time OFF to ON ON to OFF	 25µs (load dependent) 150µs (load dependent)

General Specifications	
Module Location	1734-TB, -TBS, -TB3, -TB3S wiring base assembly
Keyswitch Position	2
Pointbus Current	180mA maximum
Power Dissipation	1.9W maximum @ rated load
Thermal Dissipation	6.5 BTU/hr maximum @ rated load
Isolation Voltage (minimum)	Prequalified for 1250V ac/rms between: **Module 1** System side (PointBus) Chassis ground A/B/Z inputs O0/O1 and user power supply **Module 2** System side Chassis ground Vaux ± User power supply common
External dc Power (does not represent power required to supply outputs)	No additional external power required to power module
Field Power Bus	24V dc nominal; range 10-28.8V dc
Dimensions Inches (Millimeters)	2.21H x 0.47W x 2.97L (56.0H x 12.0W x 75.5L)
Environmental Conditions Operational Temperature Storage Temperature Relative Humidity Shock Operating Non-operating Vibration	 -20 to 55°C (-4 to 131°F) -40 to 85°C (-40 to 185°F) 5 to 95% noncondensing 30g peak acceleration, 11(±1)ms pulse width 50g peak acceleration, 11(±1)ms pulse width Tested 5g @ 10-500Hz per IEC 68-2-6
Conductors Wire Size Category	14 AWG (2.5mm^2) - 22 AWG (0.25mm^2) solid or stranded wire rated at 75°C or higher 3/64 inch (1.2mm) insulation maximum 2[2]
Terminal Base Screw Torque	7 pound-inches (0.6Nm)
Field Wiring Terminations	Module 1 0 - A 1 - A_{ret} 2 - B 3 - B_{ret} 4 - Z 5 - Z_{ret} 6 - Output 0 7 - Output 1 Module 2 0 - Chassis ground 1 - Chassis ground 2 - Return 0 3 - Return 1 4 - -V 5 - -V 6 - +V 7 - +V
Mass	1.15 oz/32.60 grams
Agency Certification (when product is marked)	CE marked for all applicable directives. C-Tick marked for all applicable acts. DeviceNet compatible as certified by ODVA, Inc.

1 Off/on delay is time from a valid output "on" signal to output energization. On/off delay is time from a valid output "off" signal to output deenergization.

2 Use this conductor category information for planning conductor routing as described in publication 1770-4.1, "Industrial Automation Wiring and Grounding Guidelines.".

Input Derating Curve for 1734-VHSC24



Note: Exceeding the maximum input voltage can cause permanent damage to the input.

Specifications for the Very High Speed Counter Module, cat. no. 1734-VHSC5

Specifications - 1734-VHSC5 Very High Speed Counter Module	
Input Specifications	
Number of Inputs	1 - 1 group of A/Areturn, B/Breturn and Z/Zreturn
Input Voltage	5V dc
Input Current	19.1mA @ 5V dc 25.7mA @ 6V dc
Input OFF-State Current	≤0.250mA max
Input OFF-State Voltage	≤1.25V dc
Input ON-State Current	≥5mA
Input ON-State Voltage	≥2.6V dc
Maximum ON-State Voltage	±6V
Input Filter Selections	Off 10µs 100µs 1.0ms 10.0ms
Maximum Input Frequency	1.0MHz counter and encoder X1 configurations 500kHz encoder X2 configuration (no filter) 250kHz encoder X4 configuration (no filter)
Output Specifications	
Number of Outputs	1 isolated group of 2 capable of 0.5A @ 24V dc
Output Control	Outputs can be tied to any of 4 compare windows
Output Supply Voltage Range	10-28.8V dc
OFF-State Leakage Current	≤0.5mA
ON-State Voltage Drop	≤0.3V dc @ 0.5A
ON-State Current	0.5A maximum
Short Circuit Current	6A - Outputs are short circuit protected and either cycle until the fault is corrected, or latch off (depending upon programming) Short circuit detected when output is turned on.
Open Wire Detection	Open wire detected when output is turned off
Delay Time OFF to ON ON to OFF	 25µs (load dependent) 150µs (load dependent)

General Specifications	
Module Location	1734-TB, -TBS, -TB3, -TB3S wiring base assembly
Keyswitch Position	2
Pointbus Current	180mA maximum
Power Dissipation	1.5W maximum @ rated load
Thermal Dissipation	5.1 BTU/hr maximum @ rated load
Isolation Voltage (minimum)	Prequalified at 1250V ac/rms between: **Module 1** System side Chassis ground A/B/Z inputs O0/O1 and user power supply **Module 2** System side Chassis ground Vaux ± User power supply common
External dc Power (does not represent power required for outputs)	No additional external power required to power module.
Field Power Bus	24V dc nominal; range 10-28.8V dc
Dimensions Inches (Millimeters)	2.21H x 0.47W x 2.97L (56.0H x 12.0W x 75.5L)
Environmental Conditions Operational Temperature Storage Temperature Relative Humidity Shock Operating Non-operating Vibration	 -20 to 55°C (-4 to 131°F) -40 to 85°C (-40 to 185°F) 5 to 95% noncondensing 30g peak acceleration, 11(±1)ms pulse width 50g peak acceleration, 11(±1)ms pulse width Tested 5g @ 10-500Hz per IEC 68-2-6
Conductors Wire Size Category	14 AWG (2.5mm^2) - 22 AWG (0.25mm^2) solid or stranded wire rated at 75°C or higher 3/64 inch (1.2mm) insulation maximum 2[2]
Terminal Base Screw Torque	7 pound-inches (0.6Nm)
Field Wiring Terminations	Module 1 0 - A 1 - A_{ret} 2 - B 3 - B_{ret} 4 - Z 5 - Z_{ret} 6 - Output 0 7 - Output 1 Module 2 0 - Chassis ground 1 - Chassis ground 2 - Return 0 3 - Return 1 4 - -V 5 - -V 6 - +V 7 - +V
Mass	1.15 oz/32.60 grams
Agency Certification (when product is marked)	CE marked for all applicable directives. C-Tick marked for all applicable acts. DeviceNet compatible as certified by ODVA, Inc.

1 Off/on delay is time from a valid output "on" signal to output energization. On/off delay is time from a valid output "off" signal to output deenergization.

2 Use this conductor category information for planning conductor routing as described in publication 1770-4.1, "Industrial Automation Wiring and Grounding Guidelines.".

A

active features per mode 1-10
assembly selection 3-8, 3-11

B

base assembly, mounting 2-1

C

CE directives P-2
checking I/O defaults 4-6
class instance attribute editor 5-2
class instance editor 5-1
commissioning a node 4-2
compare window on/off values 3-10
configuration data 3-6
configuration software 4-1
connecting an output to a compare window 1-12
connecting outputs to compare windows 3-9
continuous/rate measurement mode 1-2
continuous/rate mode - operation 1-7
counter control 3-5
counter mode 1-2
counter mode operation 1-2
counter type selection 3-6

D

data table - complete format 3-1
decimal position - frequency or counter display 3-7
derating curve - 1734-VHSC24 A-3
directives, European Union P-2

E

encoder mode 1-2
encoder mode operation 1-3

F

feedback 1-1
filter selection 3-7
filter settings 1-1
format - data table 3-1

G

gate interval setting 3-8

I

indicators 6-1
input status indicator 6-2
input voltage range 1-1
input word - present channel data 3-2
installation - module 2-2
installation - wiring base assembly 2-1
installation, module 2-2
installation, removable terminal block 2-4

K

keyswitch position 2-3

M

modes of operation 1-2
module installation 2-2
module status indicator 6-1
module/channel error bits 3-3
mounting base, removal 2-4
mounting, base assembly 2-1

N

network status indicator 6-2
new data indicator 1-9
node commissioning tool 4-2
node setting (out of box) 4-2

O

operating mode features 1-10
operation - continuous/rate mode 1-7
operation - counter mode 1-2
operation - encoder mode 1-3
operation - pulse width modulation mode 1-8
operation - rate measurement mode 1-8
operation - scalar 1-6
output control 1-12
output data control word 3-5
output status indicator 6-2
output ties 3-9
outputs 1-2

P

parameter setting 4-4
period rate mode - operation 1-5
period/rate mode 1-2

positioning the keyswitch 2-3
present channel data 3-2
preset configuration 3-10
pulse width modulation mode 1-2
pulse width modulation mode operation 1-8
pulse width modulation output word 3-6
PWM mode 1-2
PWM timebase selection 3-8

R

rate measurement mode 1-2
rate measurement mode operation 1-8
rollover configuration 3-10
RTB, installation and removal 2-4

S

safe state configuration 3-11
scalar 3-9
scalar operation 1-6
scalar selection 3-9
selecting a filter 3-7
selecting counter type 3-6
selecting the scalar setting 3-9
setting module parameters 4-4
setting rollover counts 3-10
setting safe state values 3-11
setting the compare windows 3-10
setting the counter gate interval 3-8
setting the preset value 3-10
specifications - 1734-VHSC5 A-3
specifications for the 1734-VHSC24 A-1
stored/accumulated channel data 3-2

V

viewing EDS files 4-6

W

wiring base assembly 2-1

Z

Z gate/reset terminal modes of operation 1-10
Z gate/reset terminal operation 1-10

Allen-Bradley
Publication Problem Report

If you find a problem with our documentation, please complete and return this form.

Pub. Title/Type Very High Speed Counter Module User Manual

Cat. No. 1734-VHSC24, 1734-VHSC5 Pub. No. 1734-UM003A Pub. Date August 2000 Part No. 957293-30

Check Problem(s) Type:	Describe Problem(s)			Internal Use Only
☐ Technical Accuracy	☐ text		☐ illustration	
☐ Completeness	☐ procedure/step	☐ illustration	☐ definition	☐ info in manual
What information is missing?	☐ example	☐ guideline	☐ feature	(accessibility)
	☐ explanation	☐ other		☐ info not in manual
☐ Clarity				
What is unclear?				
☐ Sequence				
What is not in the right order?				
☐ Other Comments				
Use back for more comments.				

Your Name _____ Location/Phone _____

~~Return to: Marke~~ting Communications, Allen-Bradley., 1 Allen-Bradley Drive, Mayfield Hts., OH 44124-6118Phone:(440) 646-3176
FAX:(440) 646-4320

Other Comments

PLEASE FOLD HERE

PLEASE REMOVE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 18235 CLEVELAND OH

POSTAGE WILL BE PAID BY THE ADDRESSEE

Allen-Bradley
RELIANCE ELECTRIC
DODGE
ROCKWELL SOFTWARE
Rockwell Automation

1 ALLEN-BRADLEY DR
MAYFIELD HEIGHTS OH 44124-9705

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: (1) 414 382-2000, Fax: (1) 414 382-4444
European Headquarters SA/NV, avenue Herrmann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 1734-UM003A-EN-P - August 2000

PN 957293-30

© 2000 Rockwell International Corporation. Printed in the U.S.A.